

Application No. 09/758,606
Filed: January 11, 2001
TC Art Unit: 2644
Confirmation No.: 9889

REMARKS

The instant Remarks are filed in response to the official action dated June 21, 2004. Reconsideration is respectfully requested.

The status of the claims is as follows:

Claims 1-27 are currently pending.

Claims 1-27 stand rejected.

The Examiner has rejected claims 1-4, 8-10, 12-14, and 25-26 under 35 U.S.C. 103(a) as being unpatentable over Norris (USP 5,885,129) in view of Croft III et al. (USP 6,584,205), and further in view of Kuhl et al. (ACUSTICA, Vol. 4, 1954, No. 5, "Condenser Transmitters and Microphones with Solid Dielectric for Airborne Ultrasonics"). Specifically, the official action indicates that the Norris reference discloses an acoustic transducer array having a bandwidth greater than 5 kHz, that the Croft reference discloses a system for pre-processing an audio signal that results in lower distortion and better reproduction of an acoustic signal for a parametric array output, and that the Kuhl reference discloses a Sell-type transducer having a backplate and grooves for providing an inverted distortion in the projected signal. The Applicant respectfully submits, however, that the official action has failed to establish a *prima facie* case of

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obviousness, and therefore the rejections of claims 1-4, 8-10, 12-14, and 25-26 under 35 U.S.C. 103 are unwarranted and should be withdrawn.

It is well settled that to establish a *prima facie* case of obviousness, there must be some suggestion or motivation, either in the prior art references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify a reference or to combine reference teachings. Combining prior art references without evidence of such a suggestion, teaching, or motivation simply takes the inventor's disclosure as a blueprint for piecing together the prior art to defeat patentability, which is the essence of an improper hindsight analysis. Because the Norris, Croft, and Kuhl references contain no such suggestion, teaching, or motivation to combine the references, as suggested in the official action, a *prima facie* case of obviousness has not been established, and therefore the rejections of the claims under section 103 of the Patent Laws are unwarranted and should be withdrawn.

Such failure to establish a *prima facie* case of obviousness can be demonstrated by a consideration of the various problems addressed by the cited references. For example, the Norris reference addresses the problem of increasing the projection range

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of toy weapons such as toy rifles, toy pistols, and space-type toy weapons (see column 1, lines 11-34, of Norris). Norris solves this problem by providing a toy with a configuration that supplies a directional orientation for aiming the toy body at a target, in which the toy body includes a parametric speaker (see column 2, lines 1-5, of Norris).

The Croft reference addresses the problem of reducing the distortion in the acoustic output of a parametric array in air (see column 1, lines 14-33, of Croft III et al.). Croft III et al. solve this problem by providing a recursive error correction technique that corrects such distortion without increasing the required bandwidth to reduce the distortion (see column 3, line 31, to column 4, line 14, of Croft III et al.). It is noted that the Kuhl reference merely provides a report on developments in condenser microphones for ultrasonics, particularly, condenser systems with solid dielectrics, in which the quality of foil, the shape of a backplate, the mechanical stress, and the applied DC voltage are investigated (see page 520 of Kuhl et al.).

The Applicant focuses on the problem of reducing distortion generated by a parametric audio system for generating airborne audio signals (see, e.g., page 3, lines 3-7, of the application). The Applicant solves this problem by nonlinearly processing an

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audio signal to generate a pre-distorted signal, converting the pre-distorted signal into ultrasonic frequencies, and projecting the pre-distorted ultrasonic signal through the air by an acoustic transducer array to invert the distortion and to regenerate the audio signal with reduced net distortion, as recited in base claim 1. Because the pre-distorted signal generated by the Applicant's system generally expands the need for ultrasonic bandwidth (see, e.g., page 6, lines 21-25, of the application), the acoustic transducer array has a wide bandwidth, i.e., greater than 5 kHz, as recited in claim 1.

The Applicant respectfully submits that the disclosure of the Norris, Croft, and Kuhl references provide no motivation to combine the references, as suggested in the official action. As indicated above, the Norris reference addresses the problem of increasing the projection range of toy weapons. Significantly, the Norris reference is completely unconcerned with reducing distortion in airborne audio beams. As described above, the Norris device is merely a toy that includes a parametric speaker. Norris discloses that the purpose of the parametric speaker is to allow a user to hear the sounds that the toy sends toward the target. Such sounds may include various bursts, bangs, hums, whistles, sirens, swishes, and buzzes useful to simulate a weapon

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(see column 4, lines 12-14, of Norris). The Applicant submits that the typical user of the Norris toy would probably not be troubled if the bursts, bangs, hums, whistles, sirens, swishes, and buzzes generated by the toy included some distortion. In fact, such distortion in the sounds generated by the Norris toy might even enhance the user's enjoyment.

As also indicated above, the Croft reference addresses the problem of reducing the distortion in the acoustic output of a parametric array in air. In contrast, the Norris reference addresses the problem of increasing the projection range of toy weapons. Because the problems addressed by the Norris and Croft references are significantly different, and because limited benefit would likely be derived from reducing the distortion generated by Norris' toy weapon, the Applicant respectfully submits that one of ordinary skill in the art would not have been motivated to combine these references, as suggested in the official action. The Applicant further submits that the Kuhl reference merely reports on developments in condenser microphones for ultrasonics, and contains no motivation for making the suggested combination with the Norris and Croft references. Because no motivation exists for combining the Norris, Croft, and Kuhl references, a *prima facie* case of obviousness has not been

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established. Accordingly, it is respectfully submitted that the rejections of claims 1-4, 8-10, 12-14, and 25-26 under 35 U.S.C. 103 are unwarranted and should be withdrawn.

Even if a *prima facie* case of obviousness were properly established, the resulting combination of the Norris, Croft, and Kuhl references still would not render claims 1-4, 8-10, 12-14, and 25-26 obvious. For example, the parametric audio system of claim 1 is configured and arranged such that the acoustic bandwidth available for transmission of the pre-distorted signal through the air is broad, i.e., greater than 5 kHz. The parametric audio system employs a signal conditioner to reduce or eliminate distortion in the audio reproduced from the transmitted pre-distorted signal. As mentioned above, the pre-distorted signal provided by the Applicant's system generally expands the need for ultrasonic bandwidth.

The Applicant respectfully submits that the parametric audio system recited in base claim 1 is significantly different from the toy weapon disclosed by Norris. Specifically, the parametric audio system of claim 1 includes an acoustic transducer array having a bandwidth greater than 5 kHz to provide a broad acoustic bandwidth for transmission of a pre-distorted sound beam through the air. In contrast, the toy weapon disclosed by Norris is

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capable of emitting a sonic compression wave having a frequency equal to 5 kHz. Unlike the instant application, Norris discloses nothing about the acoustic bandwidth available for transmission of the sonic compression wave through the air. In addition, the Norris reference neither teaches nor suggests pre-distorting a sound beam before emitting the sound beam through the air for subsequent de-coupling of a new sonic signal.

Although Croft III et al. describe a system for pre-processing an audio signal to reduce distortion, the Applicant respectfully submits that the Croft system teaches away from the subject matter of base claim 1. As mentioned above, the Croft system includes a recursive error correction technique that corrects distortion without increasing the required bandwidth to reduce the distortion (see column 3, line 31, to column 4, line 14, of Croft III et al.). The Croft reference contains a thorough discussion of the problem of distortion associated with parametric arrays in air, particularly, the problem of distortion being introduced in the acoustic output of the parametric array due to the non-linearities in the air (see column 1, lines 27-30, of Croft III et al.). The Croft reference also contains a discussion of the application of a square root function to a modulation envelope to compensate for the natural squaring function that

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distorts the envelope of a modulated side-band signal emitted to the air (see column 1, lines 54-60, of Croft III et al.). According to the Croft reference, those skilled in the art have shown that the square root double side-band can theoretically produce a low distortion system, but at the cost of infinite system and transducer bandwidth (see column 1, lines 60-63, of Croft III et al.). Because of the impracticality of producing any device having an infinite bandwidth capability, and because of the belief that any significant bandwidth might cause ultrasonic frequencies on the lower side-band to extend down into the audible range and cause new distortion, Croft III et al. effectively abandon the idea of developing a parametric audio system that provides a wide acoustic bandwidth for the transmitted ultrasonic sound waves (see column 1, line 63, to column 2, line 3, of Croft III et al.). Instead, Croft III et al. focus on developing a system for pre-processing the audio signal that results in lowered distortion with a decreased bandwidth requirement for the ultrasonic parametric array output (see column 3, lines 20-24, of Croft III et al.).

As explained above, the pre-distorted signal generated by the Applicant's parametric audio system generally expands the need for ultrasonic bandwidth (see, e.g., page 6, lines 21-25, of the

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application). For this reason, the Applicant's system includes an acoustic transducer array having a wide bandwidth, i.e., greater than 5 kHz, as recited in base claim 1. The Croft reference teaches away from the subject matter of claim 1 since it describes a recursive error correction technique that has a decreased bandwidth requirement. Such "teaching away" of the Croft reference is viewed as self-contained evidence of the public's not having the Applicant's claimed invention in its possession. Further, the Croft reference's "teaching away" negates any motivation to combine the Croft reference with the Norris and Kuhl references to obtain the Applicant's system, which, in contrast to the combined teachings of the Norris, Croft, and Kuhl references, provides reduced distortion via a broad acoustic bandwidth.

In addition, the Applicant respectfully asserts that the Kuhl reference does not cure the deficiencies of the Norris and Croft references. Notwithstanding the above assertion, the mere fact that the Kuhl reference was published 45 years before the publication of the Norris reference, and almost 50 years before the publication of the Croft reference, is a secondary consideration that may be construed as evidence against any holding that it would have been obvious to combine the teachings of the cited references to obtain the claimed subject matter. The

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Applicant points out that active research in the field of airborne ultrasonics continued unabated throughout the 45-50 years between the publications of the Kuhl reference and the Norris and Croft references without the appearance of the Applicant's claimed invention.

The Applicant further points out that the Croft reference discloses reducing distortion by lowering the modulation level, but at the expense of both a lower output volume and a lower power efficiency (see column 1, lines 31-34, of Croft III et al.). The Applicant respectfully submits, however, that neither the Norris reference, nor the Croft reference, nor the Kuhl reference, either alone or in combination, discloses a parametric audio system that includes a signal conditioner for nonlinearly processing an audio signal to provide a pre-distorted signal, a modulator for converting the pre-distorted signal into ultrasonic frequencies, and an acoustic transducer array including at least one acoustic transducer for projecting the converted signal through the air along a selected path, thereby inverting distortion in the projected signal and regenerating the audio signal along the selected path with reduced net distortion, in which the required broad system bandwidth is provided at least in part by the

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acoustic transducer array having a bandwidth greater than 5 kHz,
as recited in base claim 1.

Claims 2-9 refine the acoustic transducer array of base claim 1 by reciting that each acoustic transducer in the array is a membrane-type transducer. The Applicant respectfully submits that the Kuhl reference neither teaches nor suggests providing a membrane-type transducer in an acoustic transducer array for increasing the bandwidth of a parametric audio system. The Applicant further submits that no motivation can be found for combining the Kuhl reference with the Norris and Croft references to obtain a parametric audio system that uses such an acoustic transducer to reduce distortion, as recited in base claim 1.

With respect to claim 8, the Applicant respectfully points out that Kuhl discloses a solid dielectric emanating sound itself. In contrast, the Applicant claims the use of an immobile dielectric spacer (which does not output sound) configured to support the membrane of the acoustic transducer (which is actually making the sound), and to provide it with an increased electric field.

With respect to claim 12, the Applicant respectfully points out that although it is understood that a membrane-type transducer has an active area, it was heretofore unknown and untested that

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increasing the active area of the transducer would have a dramatic impact on output levels. The Norris device, being the size of a toy gun barrel, likely has an insufficient active area for reliably recreating audio.

For at least the reasons outlined above, the Applicant respectfully submits that the suggested combination of the Norris, Croft, and Kuhl references does not render claims 1-4, 8-10, 12-14, and 25-26 obvious. Accordingly, it is respectfully submitted that the rejections of claims 1-4, 8-10, 12-14, and 25-26 under 35 U.S.C. 103 are unwarranted and should be withdrawn.

The Examiner has rejected claim 5 under 35 U.S.C. 103(a) as being unpatentable over Norris in view of Croft III et al., further in view of Kuhl et al., further in view of the Applicant's admitted prior art, and further in view of Johnson et al. (USP 5,394,732). The Applicant respectfully submits, however, that the Johnson reference fails to cure the deficiencies of the Norris, Croft, and Kuhl references, and the Applicant's admitted prior art. Accordingly, it is respectfully submitted that this suggested combination of references and admitted prior art does not render claim 5 obvious.

In addition, the Applicant points out that the Johnson reference describes a system that is significantly different from

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the Applicant's claimed system. Specifically, Johnson discloses an amplifier that generates unwanted DC, which is then blocked by a capacitor from reaching the transducer itself (see column 8, line 68+, of Johnson et al.). The capacitor of the Johnson reference does not block a DC bias from the driver amplifier, as recited in claim 5. The other blocking capacitor described in the Johnson reference acts only on the receiver signal, and does not involve a driver amplifier (see column 9, line 47+, of Johnson et al.).

The Examiner has rejected claim 11 under 35 U.S.C. 103(a) as being unpatentable over Norris in view of Croft III et al., further in view of Kuhl et al. and further in view of Rush (USP 4,991,221). The Applicant respectfully submits, however, that the Rush reference fails to cure the deficiencies of the Norris, Croft, and Kuhl references. Accordingly, it is respectfully submitted that this suggested combination of references does not render claim 11 obvious.

In addition, the Applicant respectfully points out that the Rush reference describes a traditional loudspeaker crossover network, which divides a signal among many different drivers, each having a preferred frequency range of operation. In contrast, the parametric audio system of claim 11 operates to compensate for the

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non-flat response of the transducer itself - no signal dividing
occurs at all.

The Examiner has rejected claims 20-24 under 35 U.S.C. 103(a) as being unpatentable over Norris in view of Croft III et al., further in view of Kuhl et al., further in view of the Applicant's admitted prior art, and further in view of Beaver (USP 4,005,382). The Applicant respectfully submits, however, that the Beaver reference fails to cure the deficiencies of the Norris, Croft, and Kuhl references, and the Applicant's admitted prior art. Accordingly, it is respectfully submitted that this suggested combination of references and admitted prior art does not render claims 20-24 obvious.

In addition, the Applicant respectfully points out that the Beaver reference describes subject matter, i.e., ultrasonic imaging, which is completely unrelated to the Applicant's claimed invention. Scanning via a phased array is described in the Beaver reference, but only for the "receiving" and imaging of ultrasound - not for the transmission of audio signals.

Finally, the Applicant respectfully submits that the cited Babcock et al. (USP 3,565,209), Seeler (USP 3,373,251), William Jr. et al. (USP 5,406,503) and Thompson (USP 4,122,725) references fail to cure the deficiencies of the Norris, Croft, and

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Kuhl references. The Applicant therefore submits that the various suggested combinations of these references, as outlined in the official action, do not render the Applicant's claimed invention obvious. Accordingly, it is respectfully submitted that all of the rejections of the claims under 35 U.S.C. 103 are unwarranted and should be withdrawn.

In view of the foregoing, it is respectfully submitted that the present application is in a condition for allowance. Early and favorable action is respectfully requested.

The Examiner is encouraged to telephone the undersigned Attorney to discuss any matter that would expedite allowance of the present application.

Respectfully submitted,

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